

**NASA Technology Planning
Database System Requirements Document
Version 2.0**
(10/27/98 -Preliminary)



National Aeronautics
and
Space Administration

**Goddard Space Flight Center
Greenbelt, Maryland**

**NASA Technology Planning Database System Requirements Document
Version 1.0**

Prepared By: Maria M. So. Date: 8/19/99
Maria So, Chris Schwartz
NASA Technology Planning and
Integration Office

Approved By: Gregory Rack Date: 8/19/99
Gregory Rack
NASA Deputy Chief Technologist
NASA Headquarters

Table of Contents

1. INTRODUCTION.....	4
2. SYSTEM OBJECTIVES.....	5
3. BACKGROUND	6
4. REQUIREMENTS.....	6
OVERALL SYSTEM MANAGEMENT	8
ENTERPRISE TECHNOLOGY PLANNING	8
DATABASE CONTENT AND STRUCTURE	8
USER INTERFACE	9
ACCESS AND SECURITY	10
CONFIGURATION CHANGE CONTROL	10
GENERAL SYSTEM.....	10
BACKUP AND RECOVERY	12
PERFORMANCE.....	12

Acknowledgment:

Thanks to Lisa Callahan, Gary Martin, Greg Reck for reviewing the content and the accuracy of this document and for providing comments.

Thanks to:

Ron Kahl, JSC
Charlene Gilbert, JSC
Wallace Harrison, LaRC
Craig McCreight, ARC
Wagne Schober, JPL
John West, MSFC
Gene Fujikawa, LeRC
Lou Schuster, Code Y
Paul Caruso, Earth Science Office, GSFC
Glen Mucklow, Code SM
Guy Fogleman, Code U
Jerry Seidel, Code RT
Eric Sunberg, NRO
Dot Zukor, GSFC, Code 900
Darrell Jan, Code U

for providing lessons learned to the NASA Technology Inventory database.

1. Introduction

This document establishes the system requirements of the NASA Technology Planning Database System (NTPDS) developed and managed at Goddard Space Flight Center (GSFC) under the NASA Technology Planning and Integration Office (NTIPO). NASA Technology Planning Database is a management tool used for the overall NASA-wide strategic planning of technology and to help assess the health and effectiveness of the technology development program. This tool helps in planning by providing tracibility directly from the NASA Strategic Plan, through enterprise, mission areas, to challenges, to concepts, and finally to actual technology developments (Figure 1).

The NASA Technology Planning Database System is a unified, integrated technology database which includes the technology programs of all enterprises and supports enterprise specific planning.

This document represents the requirements that are being used to develop system concept, operations scenarios, as well as design, implementation, and test and integration of the database and its user interface. The Technology Planning database and system will be implemented in phases. The first system release will provide an operational system with limited capability, and the subsequent releases will expand the system capability according to the system priorities defined by the needs of the users.

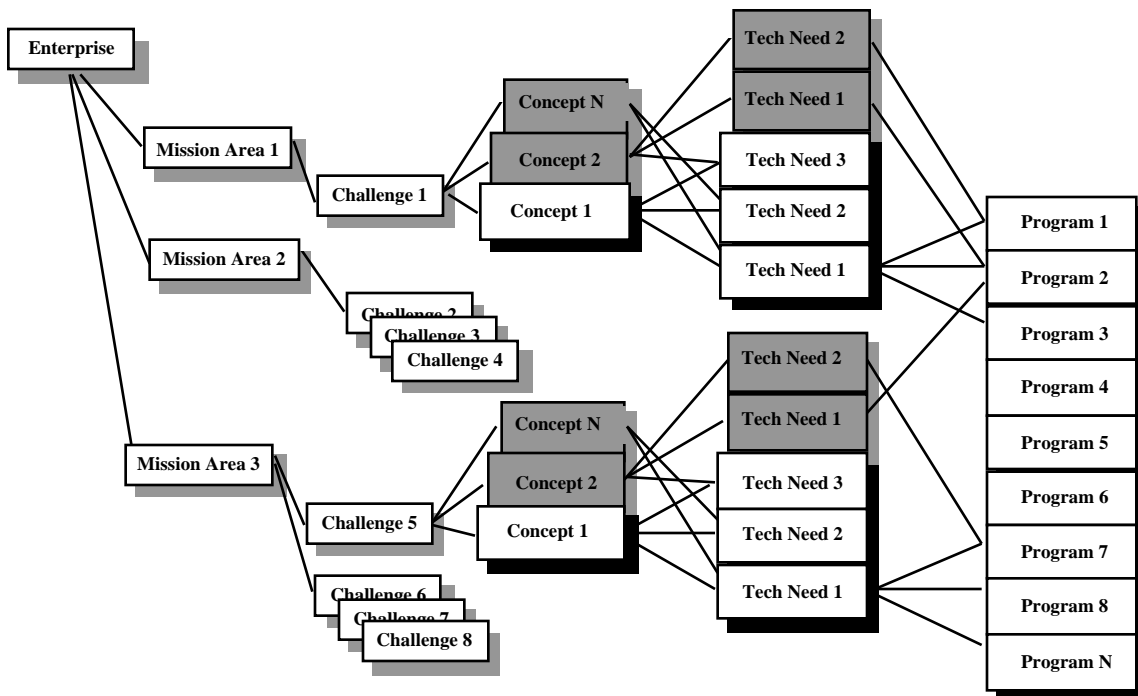


Figure 1.

2. System Objectives

Major objectives of the Technology Planning database and system are listed as follows:

- Provide an integrated database and planning tool that can replace the functionality of currently disparate technology planning processes and technology databases
- Provide easy (point and click) and fast access to NASA technology strategic planning and program data from anywhere in the country
- Capture and track budget information from the planning phase through the POP or other budget allocation process and to program execution
- Incorporate the latest proven database and web technologies to the maximum extent practical
- Maximize the use of Commercial Off-The-Shelf (COTS), -industry standard, and non-proprietary to avoid custom software development and maintenance where practical

The NTPDS will provide NASA policy makers with a tool to promote the development of technologies that are aligned with NASA's primary goals. The information will be used to help keep Congress and external review committees aware of the current NASA technology program. The NTPDS will provide the metrics to describe the content of the program.

The planning portions of the NTPDS will provide technology planners with a method for tracing and capturing requirements starting with NASA and enterprise strategic plans. Technology planning organizations and NASA senior management can browse the technology planning data and the statistics generated from such data. Reports can be generated at each planning stage. These hard copy reports can be used as input to the next planning step. System users will be able to access the technology planning database for display, search, and print capability. The input functions of the NTPDS will provide cognizant organizations as designated by enterprise management with a method for updating the content of the database. It will also provide the NTIPO database administrator capabilities of maintaining the entire database and system.

Planning using the NTPDS can be tailored to the enterprise. Normally each enterprise mission area will have challenges that it is attempting to fill. These challenges can be satisfied in a variety of ways. Each approach to satisfy the challenge is referred to as a concept. Concepts in turn have technical needs or requirements associated with them. The requirements then are satisfied by technical programs within NASA or elsewhere. The progression of Enterprise, Mission Area, Challenge, Concept and Tech Need can be tailored to the individual enterprise (Figure 2).

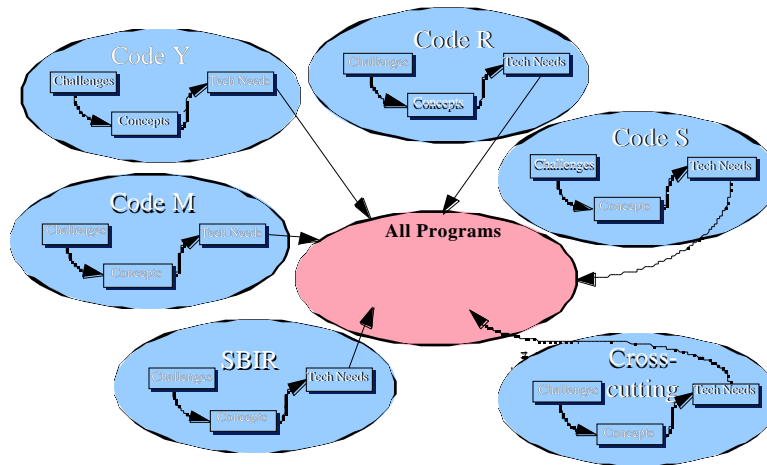


Figure 2.

3. Background

The Database under development is loosely modeled on the Air Forces “Strategies to Tasks” database. The Air Forces planning tool was developed at Phillips Labs in mid-90’s. Key proponent of this approach to strategic planning were Jay Melin (now of Aerospace Corp) and Dr. Paul Chivington (Aerospace Corp).

NASA’s technology inventory has resulted from a “capture” operation. Empty database “shell” were stylized for each enterprise and delivered to each enterprise. The Associate Administrator of each enterprise had responsibility to populate the shell with technology data in which the enterprise has invested. In all cases the Associate Administrator (AA) delegated this responsibility to someone within the enterprise. This representative had the authority of the AA to collect the data. Top down estimates were generated by each enterprise to validate the database to a first order. Where significant discrepancies were noted, efforts continued to explain the differences or collect more data.

Data has been used to explain NASA technology investments, trends within NASA technology spending and provide insights into possible strategic improvements.

4. Requirements

The requirements contained in this section are derived from the current NASA Technology Inventory database, NASA Crosscutting Technology database, Earth Science database, and the lessons learned associated with these systems. These data were analyzed and a focused and expanded set of system requirements was developed.

These requirements are grouped in the following categories:

- Overall system management
- Enterprise technology planning
- Database content and structure
- User Interface
- Access and security

- Configuration change control
- General System
- Backup and recovery
- Performance

The following tables contain requirements grouped in the categories described above. Column one in each table contains the Requirement Reference Number (Ref. No). Each requirement has an unique reference number for tracibility purpose. Column two contains the requirement description. Each requirement also has a priority (i.e. High, Medium, Low) associated with it. The final priority of each requirement is assigned by the NASA Deputy Chief Technologist based on the input and lessons learned from the key users and is shown in Column three. According to the priority assigned, each requirement will then be implemented in future system releases.

Overall System Management

Ref · No	Requirement Text	Priority
0.0	Overall system management	
0.1	The overall system development and enhancement directions are subject to the approval of the NASA Deputy Chief of Technologist.	
0.2	The database lead or his/her designee in the NTIPO shall provide the overall control of the system, from design, development, to management. The database lead shall have the authority to modify, but not limited to, database structure, user interface layout, user specified outputs, and security/access control without any outside assistance.	
0.3	The database lead or his/her designee shall accept direction regarding database functionality and performance directly from the Office of NASA Chief of Technologist, the Associate Administrator of each enterprises) needs and shall produce results in a timely manner.	
0.4	The database lead or her designator shall be responsible for maintaining the entire database and system.	
0.5	The system shall provide COTS database design, administration, and maintenance tools to allow the database lead to perform overall system management function.	
0.6	The system shall avoid using proprietary software of any sort and shall use COTS products to minimize development and maintenance cost.	

Enterprise Technology Planning

Ref · No	Requirement Text	Priority
1.0	Enterprise Technology Planning	
1.1	The system shall support enterprise technology planning in ways specific to each enterprise within NASA.	

Database content and structure

Ref · No	Requirement Text	Priority
2.0	Database content and structure	
2.1	The database shall provide a structure to accommodate future technology planning data in hierarchical manner, including but not limited to data for enterprises, mission areas, challenges, concepts, technology needs, and programs.	
2.2	The database structure shall be relational, linking data from highest goals, through detailed requirements, to program implementations.	
2.3	The database structure shall be flexible enough to allow future	

	expansion.	
2.4	The database shall provide a structure to accommodate all data currently residing in the Technology Inventory, Crosscutting Technology, and Earth Science Technology databases.	
2.5	The database shall be implemented using COTS database management products to minimize custom software development and maintenance.	
2.6	The database shall provide standard COTS database management system functions, including but not limited to insert, update, delete, display, and search functions.	
2.7	The system shall provide database builds at specified intervals or on-demand.	
2.8	The system shall provide capability to distribute database(s) to predefined users (i.e. JPL, Earth Science).	
2.9	The system shall be extremely flexible to allow rapid data field expansions, database structure alterations, and insertion or deletion of data interdependencies.	
2.10	The system shall support an interactive input process.	
2.11	The system shall support database updates by importing an external technology data file. These files populated by the Associate Administrator of each enterprise or their designee.	
2.12	The database shall provide functionality to validate the input data according to the data specification. Validation will be performed either when data are imported or data entered directly into the database.	
2.13	Inputs to the NTPDS shall be able to automatically be imported to other NASA databases, including but not limited to the Tech Track database, the SBIR database, as appropriate.	

User Interface

Ref No	Requirement Text	Priority
3.0	User Interface	
3.1	The user interface shall be easy to use (point and click).	
3.2	The system shall provide single Graphical User Interface (GUI) to access all functions.	
3.3	The system shall use Web-based GUI that allows system access from anywhere in the US.	
3.4	The user interface shall reflect the NASA technology planning and integration process flow and allow users to navigate the system using such concept.	
3.5	The system shall provide users with the capability to generate outputs based on the data stored in the database.	
3.6	The system shall provide statistics currently available in the Technology Inventory, Crosscutting Technology, and Earth Science databases.	
3.7	The system shall provide for controlled data entry by password and access site.	
3.8	The system shall provide user-specified outputs for future data, such as Technology Planning data.	

3.9	The system shall provide for read access at a variety of level. Technology planners will have full access to read and summarize all data. The general public will have access to all records, but sensitive data will be hidden.	
-----	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--

Access and security

Ref No	Requirement Text	Priority
4.0	Access and security	
4.1	The system shall allow maximum freedom to access data while maintaining the integrity of the data.	
4.2	The system shall allow platform-independent access to data from the office environment using commercial standards.	
4.3	The system shall allow access via Mac and PC.	
4.4	The system shall provide secure remote accessibility via Internet/Intranet.	
4.5	The system shall have multilevel security enforced by password and access site.	
4.6	Access control and security of NTPDS shall be enforced and maintained by the NTPDS database lead or his/her designee.	
4.7	The system shall allow interoperability to other databases and systems within NASA, other governmental agencies and industry with data shared at various levels.	

Configuration change control

Ref No	Requirement Text	Priority
5.0	Configuration change control	
5.1	The system shall provide automatic data configuration management.	
5.2	The system shall provide comprehensive design, configuration management, and change management covering both hardware and software.	

General System

Ref No	Requirement Text	Priority
6.0	General System	
6.1	The system shall be scaleable from a single server supporting a few users to multiple servers capable of supporting many users from NASA centers and other federal agencies.	

6.2	The system main server and its maintenance shall under the direct control of the NTIPO office.	
6.3	The system shall provide on-line help to users.	
6.4	The system shall provide users easy to understand status and error messages.	

Backup and recovery

Ref No	Requirement Text	Priority
7.0	Backup and recovery	
7.1	The system shall support daily backup.	
7.2	Total loss of the system through hardware/software failure, fire, or catastrophic loss will never result in a loss of more than one day's data.	
7.3	Multiple site backup shall safeguard the system in the event of catastrophic loss.	
7.4	The system shall provide tools to support system and database recovery.	

Performance

Ref No	Requirement Text	Priority
8.0	General Performance	
8.1	Latency of response shall be no greater than twice the latency of the networks used to provide the data	
8.2	The system shall provide consistent latency, independent of the number of users.	

Appendix A

Cross-Enterprise Technology Development Program (CETDP) Specific Requirements

Approved By: _____ Date: _____
Denise Traver
Cross Enterprise Technology Development
Formulator Manager

Approved By: _____ Date: _____
Stephen Prusha
Cross Enterprise Technology Development
Implementor Manager

Cross-Enterprise Technology Development Program (CETDP) Specific Requirements

1- Data Fields

Ref. No	Requirement Text	Priority
A1-0	<p>Each CETDP product shall include one Work Break Down Structure (WBS). The WBS shall have the following structure:</p> <ol style="list-style-type: none"> 1).All WBS elements shall begin with the designation: CETDP 2).The second level of the WBS is by Thrust Area to reflect the management structure of the Program. Each Thrust Area has a designated two digit number in sequence starting with 01. Example: Thrust Area #1 the designation: CETDP - 01. 3).The third level of the WBS is based on the structure of the Program's budget lines which is based on NASA Strategic Technology Areas: <ul style="list-style-type: none"> Advanced Miniaturization -01 Compact Sensors and Instruments -02 Deep Space -03 Intelligent Synthesis Environment -04 Intelligent Systems -05 Self-Sustaining Human Support -06 4).The fourth level of the WBS is the technology product designated by a four-digit number in sequence starting with -0001. 	
A1-1	The CETDP portion of the database shall have the Technology Thrust Area. Each Thrust Area shall associate with a description, a Thrust Area manager, Center, Phone number and the six Program Budget Lines.	
A1-2	<p>The CETDP shall have the Requirement number with the following structure:</p> <p>98-SSE-ASO-10-01</p> <p>Fiscal year-Customer (SSE, ESE, HEDS, OCT)-Science Theme (ARO, SSE, etc.) – Mission Area number (in NASA Technology Inventory) – Priority Order</p>	
A1-3	Each product shall include a Product Property Description. The description is less than 200 words. It shall clearly and concisely giving capability of proposed product describing parameters measured (in case of a detector/instrument) or parameters controlled (in case of a thruster, MEM device), including parameter range, resolution, projected mass and size of device and cost (if estimable), lifetime, and power.	

A1-4	Each product shall include a Workforce Composition. Each Workforce Composition should associate with a FTE field. Valid values for Workforce Composition include JPL, Civil Service, Support Service Contractor, University, and Industry. This field can contain combinations of any valid values listed above. Each value appears only once per product.	
A1-5	Each product shall contain Product Category and Performance Metrics. There are three layers in this entry: First layer is the category (spectrometer, amplifier, detector array, etc.). Second layer has several entries, one for each performance parameter (if interferometer, then must have 1. throughput, 2. free spectral range, 3. stability, 4. Field of view), and the third layer has the metric for each performance parameter.	
A1-6	Each product shall include a State of the art for which the product proposer is responsible. One or more numeric fields should also be provided to capture the metrics for the state of the art.	
A1-7	Performance metrics should be defined through one or more numeric fields. This should be provided by the proposer. The units should be consistent with the state of the art so that numeric comparisons can be made.	
A1-8	Each product shall contain one or more Milestone dates. This should allow for a search through the database by month so that all milestones that are coming due in a particular month can be displayed.	
A1-9	Each product shall include a Facility Required to indicate the facility required to produce the product. For example, Test Bed is one of the valid value for this field.	
A1-10	Each product shall associate with a Competition Type. Valid values for this field are “Competitions open to all”, “Competitions only to non-NASA”, “Competition for only NASA Centers”, “Competitions within a specific NASA Center”, and “None”.	
A1-11	Each product shall associate with a detailed Government Partnership section. The valid Government Partnerships include AFRL, ARL, BMDO, DARPA, DOE, NIJ, NOAA, NRO, and NRL. Each Government Partnership can associate with multiple Partnership Type that includes “Funding”, “Staffing”, “Facility”, and “Technology Exchange”. For each Partnership Type Funding category, it shall include funding data for the current fiscal year plus four future years and one previous year. All the funding data shall be collected in \$k.	
A1-12	Each product shall associate with Inter-Center collaboration, if the collaboration exists. For each NASA Inter-Center specified, it shall associate with “Funding”, “Staffing”, “Facility”, and “Technology Exchange”. For each Inter-Center Funding category, it shall include funding data for current fiscal year plus four future years and one previous year. All the funding data shall be collected in \$k.	
A1-13	Each product shall include a “Date Conducted Non Advocate Review” field.	
A1-14	Each product shall include a “Date for Customer Review” field.	
A1-15	Each product shall associate with a discipline breakdown category. This discipline breakdown categories are as follows: 10 - Spacecraft Systems	

	20 - Instruments and Sensors 30 - Information Systems 40 - Robotics 50 - Communications	
A1-16	Each product shall include a State field to indicate where the product is being produced.	
	JPL section:	
A1-17	The system shall include a unique acronym for the Mission/Concepts/Instruments. The acronym is used as a link to technical requirements and must be unique.	
A1-18	The system shall include the name of the Mission, Instrument, Spacecraft Bus, or Generic Mission Area which is the driver for technical requirements.	

2-Data Display/ Data Search

Ref. No	Requirement Text	Priority
A2-0	The system shall display only the Workforce Composition values within each product that are not null.	
A2-1	The system shall display OSS Technology Funding (in \$M) in Current fiscal year UPN632 grouped by Technology Thrust Areas.	
A2-2	The system shall display Competed Funding Distribution (in \$M) by Center and Competition Type (including None).	
A2-3	For each Competition type, the system shall display Funding Distribution (in \$M) by Center and grouped by Thrust Areas.	
A2-4	The system shall display the Government Partnerships information grouped by NASA Centers.	
A2-5	The system shall display detailed Government Partnerships information for each NASA Center based on the Partnerships Type and grouped by each Partnership.	
A2-6	The system shall display information on Inter-Center collaboration (Center Leading the Activity vs Participating Centers) and totals.	
A2-7	For each NASA Center, the system shall list the product name, the Centers Involved, and the Type of Collaboration. The information shall be grouped by Thrust Areas listed under each NASA Center.	
A2-8	The system shall provide searching capability based on Thrust Areas. For each Thrust Area, the system shall display the NASA funding profile and FTE which shall be grouped by the six Program Budget Lines (Strategic Technology Areas) and by the current fiscal year plus four future years and two previous years. The total NASA funding profile and FTE per fiscal year shall also be provided.	
A2-9	This system shall allow for a search through the database by month for product milestones so that all milestones that are coming due in a particular month can be displayed.	
A2-10	The system shall display the Technology Need(s) that each product supports.	
A2-11	The system shall display the number of products in a particular Thrust Area.	

A2-12	The system shall display the number of products for a particular Program Budget Line or all Program Budget Lines.	
A2-13	The system shall display the FTEs for each Program Budget Line and the FTE shall be grouped by Technology Readiness Level Near Term, Mid-Term, Far-Term, and Total.	
A2-14	The system shall display the Program current funding (\$k) for each Program Budget Line. The Program current funding shall be grouped by Technology Readiness Level Near Term, Mid-Term, Far-Term, and Total.	
A2-15	The system shall display total number of products based on the searching on any or combinations of detailed product fields.	
A2-16	Export capability shall be provided.	

3-Configuration Change Control

Ref. No	Requirement Text	Priority
A3-0	The initial CETDP data shall base on the FY98 NASA Technology Inventory Database and the existing FileMakerPro CETDP database.	
A3-1	The CETDP Technology Planning team shall have the insert, update, delete, and access privileges for the data associated with the products. This group shall have the access privilege for other data in the CETDP database.	
A3-2	Each Thrust Manager shall have the insert, update, delete, and access privileges for the Thrust Area related data that he/she manages.	
A3-3	The CETDP program manager shall have insert, update, delete, and access privileges for all data.	
A3-4	During the annual NASA Technology Inventory Database data collection, the CETDP program manager shall authorize the products to be submitted to the Technology Inventory database. He/she shall click on the products to be submitted and the system shall automatic transfer the data into the appropriate Enterprise(s) staging area(s) for the Enterprise Representative(s) to review.	